

are described as new. The occurrence of two kinds of polyps differing chiefly in size is noted in a new species of *Melitodes*. The Sponge collection was large, comprising over 300 specimens, representing 110 species, besides 7 distinct varieties, of which more than half were well preserved in spirits; a large proportion—42—were new. More than one-sixth belonged to the *Ceratos*, 86 to the *Silicea*, with no representatives of the sub-order *Hexactinellida*, and there were but three species of *Calcarea*. The author deserves great credit for the painstaking way in which he has described every form, so that no doubt might remain as to its character; and where there was the slightest doubt of the form being a new species he has refrained from possibly adding to an already over-burdened synonymy.

The description of the collections from the Western Indian Ocean forms the second part of this volume, and occupies about 150 pages. The reporters are the same as in the previous part. Among the birds, Mr. Sharpe describes a new Turtle Dove (*Turtur coppingeri*) from Glorioso Islands. Mr. Edgar Smith's list of Mollusca "may be regarded as an appendix to E. von Martens's work on the 'Mollusca of the Mauritius and the Seychelles'; of the 121 species noted, between 40 and 50 do not occur in Möbius's work, and the majority of them, as might be expected, are well-known forms." Thirteen new species are described and figured.

Forty-eight species of Echinoderms are tabulated by Mr. F. Jeffrey Bell. The only object of special interest is a remarkable new Ophiurid, for which a new genus, *Neoplax*, has been established; *N. ophiodes* was found at Darros Island, Amirante Group.

The collection of Crustacea, described by Mr. E. J. Miers, though less numerous in species and less interesting than those obtained on the Australian coasts, contains a large number of rare and undescribed forms, partly owing to the fact that the groups of islands known as the Amirante, Providence, and Glorioso Groups have hitherto been unknown to the carcinologist; 104 species and varieties are enumerated from the African sub-region, of which 16 species are described as new. A useful table showing the distribution of the species on the East Coast of Africa and islands adjacent is appended to this Report.

Mr. C. O. Waterhouse describes a new beetle (*Cratopus adspersus*) from Eagle Island (Amirante), and Mr. A. G. Butler a new moth (*Deiopeia lactea*) from Providence Island (Mascarines).

The series of Alcyonaria and Sponges, as before, are described by Mr. Stuart O. Ridley. The collection of Alcyonarians made was small, not, we should imagine, because the dredgings were limited to depths not exceeding 30 fathoms, but to the difficulties of collecting on and under coral reefs. Probably the same difficulty was in the way of a collection of *Zoantharia* being made, though notably species abound all around these Western Indian Ocean Islands. Of the 8 species of Alcyonaria, 2 are noted as new. The collection of Sponges was more important, containing as it did 56 species, of which 21 are described as new. In a survey of the species the author notes that, "notwithstanding the large proportion of new specific forms, there is a comparative scarcity of forms showing marked distinctive characters of generic

importance which are not also to be found in the more familiar Atlantic fauna." Indeed this western part of the Indian Ocean may be considered, so far as the Sponge fauna goes, as transitional between Australia, South-West Africa, and the Mediterranean.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.]

The Flow of Streams

THE inclosed notes by my friend Mr. George Maw of Ben-thall Hall will no doubt interest some of your readers. They were communicated by me to Sir Wm. Thomson, who made the following remarks upon them:—"Mr. Maw's notes are extremely interesting. I lately observed similar phenomena in the streams flowing from the pools on the Burbo Bank near Liverpool. You ought to send them to NATURE."

DEAR MR. SMITH,—As I know you have been making observations on river currents and the effect of friction on the motion and passage of streams, I cannot resist sending you the accompanying notes on a very curious case we met with near the Lake of Thun. It is an extreme illustration of the action of gravitation and friction working, as it were in opposition. I have often observed something of the same kind before, but never so well marked. Looking up the stream from the lake, the effect was just like a long ladder of low waves approaching you, each separately breaking over a low fall into the lake.

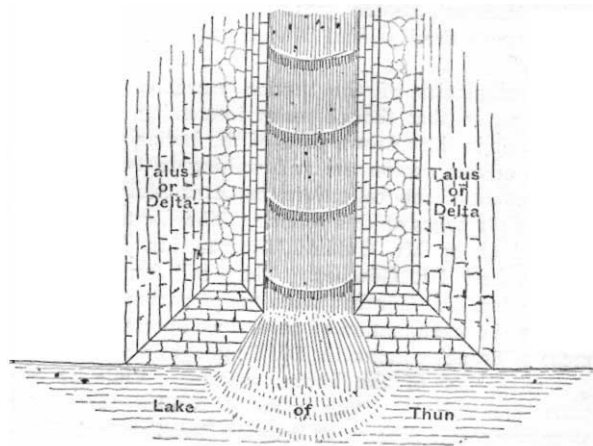
Believe me very truly yours,

GEORGE MAW

Hotel and Pension Ober, Interlaken, June 29

Notes on a Pulsating or Intermittent Stream at Merligen, on the Lake of Thun

The intermittent flow of streams familiar to us, from the rapid pulsation of the cataract to the slower rise and fall at regular intervals of less precipitous streams, is strikingly illustrated in a mountain stream flowing into the Lake of Thun, near Merligen. The lower part of its course over a small talus or sloping delta has been artificially banked up as a straight channel 15 feet wide, evenly paved and walled with stone. The lower part has an inclination of about one in twelve, and the upper part towards the mountain gorge a slope of about one in nine. It flows directly



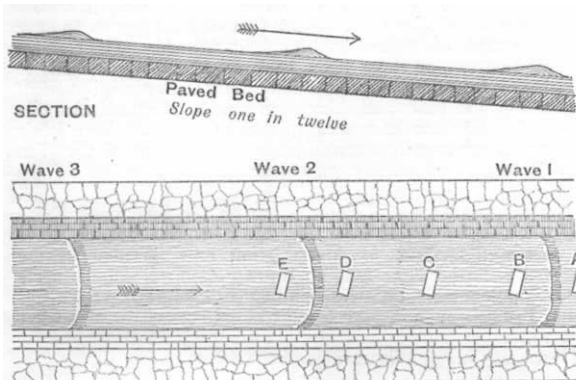
into the lake, and, viewed from the lake, presents a remarkable appearance.

The fall into the lake pulsates at intervals of $3\frac{1}{2}$ seconds by a sudden increase of volume, and the stream above, flowing over

the level paved bed presents the appearance of a ladder of low advancing waves occurring at regular intervals of about 40 feet over the lower slope of one in twelve, and at less regular intervals of about 12 feet over the steeper slope of one in nine.

Of the motion of the stream over the lower slope of one in twelve the following particulars were noticed:—

A floating body travels at the rate of $9\frac{1}{2}$ feet per second, but this does not represent the speed of any part of the water.



GROUND PLAN

Scale 32 feet to 1 inch

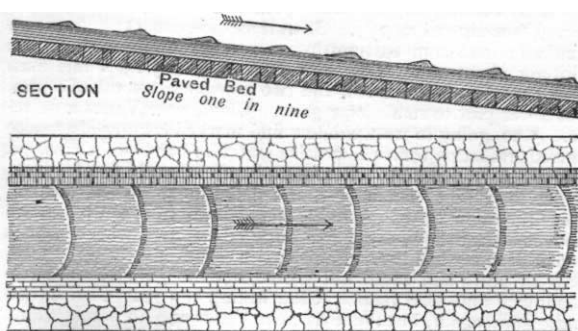
The wave-heads advanced at the rate of 13 feet a second, and the intervening stretches of stiller water (as nearly as I could judge) at about 6 feet a second. It is evident that the upper and lower currents are travelling at different rates—the bottom current retarded by friction, the surface current advanced over it by gravitation, accumulating at intervals of about 40 feet into wave-heads of a semicircular form, the sides being bent back by latent friction.

The motion of a floating body in the stream of advancing waves is very peculiar. A piece of wood thrown in at A, just in front of the advancing wave, No. 1, is for a moment carried forward by it, but the slower lower stratum gains the mastery, and the wave advances in front of the wood, which is successively found at B, C, D, E, &c. *relatively* to the advancing wave-heads, the floating wood recedes up the stream, though actually advancing at a rate between that of the upper and under or ground current.

The waves occur at intervals of about 40 feet, and occupy a trifle over 3 seconds in passing over the space that separates them.

Of the motion of the stream over the steeper slope of about one in nine, the following particulars were noticed:—

A floating body travels at the rate of $12\frac{1}{2}$ feet per second. The wave-heads were less clearly defined than on the less steep



GROUND PLAN

Scale 32 feet to 1 inch

incline, and it was difficult to accurately measure their rate of advance, but as in the other case they rapidly overshot a floating piece of wood. They occur at much shorter intervals (about 12 feet) than on the less steep incline.

GEORGE MAW

Interlaken, June 28

I may mention that my observations referred to by Mr. Maw were made upon the current of the River Severn with a view to

explain the cause why the men who navigate the barges, in descending this river by the force of the current only are enabled to steer with a moderate degree of effectiveness. The power results from the different velocities of the current at and beneath the surface. A little below the surface, roughly speaking at about one-fifth of the actual depth, the current seems to have its maximum velocity, and consequently the hull of the vessel floating down the stream is immersed in water flowing more rapidly than that at the surface, on which the rudder for the most part acts.

I was enabled to demonstrate this fact by the following simple experiment. Having noticed that leaves of trees, after lying for some time on the ground and nearly saturated with water, become almost of the same, and after a longer time of greater, specific gravity than water, it occurred to me that such leaves, while in the first-named stage, would show what I desired to know, namely, the relative velocities of the stream at different levels below its surface. Two straight bars of wood, each about thirteen or fourteen feet long, were tied together at one end, between the two the foot-stalks of a number of poplar leaves were inserted (this kind was chosen because of the length of the footstalk for insertion between the bars, and its brightness of colour rendering it more visible in the depth of the water); the bars were charged with the leaves at intervals of about three inches, and then, choosing a place where the river was of suitable depth, the bars charged with leaves were plunged into the water, the connected ends touching the ground. The water was so clear that every leaf remained visible; then I opened the ends of the bars at the surface, and was gratified by seeing every leaf floating away and preserving as to depth very nearly the same relative position. Floating with the stream in my boat, I soon saw those nearest the bottom gradually lagging behind, and still more was I gratified when, after proceeding about forty yards, the leaves that were about two feet below the surface had distanced those at the surface in an unmistakable manner by at least three feet, the current being about four feet per second. The whole series forming a curve as is here shown.



Greatly pleased with this first experiment, I was not satisfied till I had repeated it again and again, not only on that occasion, but when the wind was blowing down the river, and therefore should have accelerated the leaf at the surface, which it undoubtedly did; but only the leaf on the surface, and that to a much smaller degree than I expected, and it left unaffected all that were beneath. A calm day is the best for this experiment, because the ripple renders it difficult to see below the surface. The water must of course be clear, a condition with which we are much favoured in this river. Mr. Maw's observations of the different velocities of the pieces of wood and the wave heads are quite in harmony with mine; the depth of the water in the stream at Merlign would be only a few inches, and pieces of wood were immersed so deeply that they would be more affected by the retarded current four-fifths below than by that one-fifth at the surface.

J. P. G. SMITH

Sweyney Cliff, Coalport, Shropshire

Ocean Swells

THE late melancholy accident in Fingal's Cave, Staffa, by which three lives were lost, when several visitors to the island were washed off the railed ledge by a large wave which suddenly and unexpectedly broke into the cave, leads me to submit the following account of a somewhat similar wave and on the same part of the coast.

On the 4th inst. I took a small 5-ton sailing-boat from Oban to the Island of Lismore. We had a steady south-west breeze, going there with an even slight swell in the more open part, coming up the Firth of Lorne from the Atlantic. On our return the wind dropped to a dead calm and shifted to the south-eastward, so that to get back we took to the oars, the water becoming perfectly smooth as we neared Kerrera (between 5 and half-past 5 o'clock), when, standing at the bow, and looking seaward, I was surprised to see a broad wave or long swell coming from the south-westward, followed by two minor undulations. They